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U.S. Patent Application No. 09/622,397
ATTORNEY'S DOCKET NO. FUK-75

DECLARATION UNDER 37 CFR § 1.132

We, the below-signed, declare that:

1) We are the inventors and Applicants of the present invention, as set forth in U.S. Patent Application Number 09/622,397, filed August 16, 2000.

2) Having both an ammonium fluoride concentration higher than 40% and a hydrofluoric acid concentration lower than 0.1% is critical to the invention in that a high concentration of ammonium fluoride slows the etching rate of a CVD film or TEOS film and has sufficient performance with respect to removing a natural oxidation film (page 6 of the specification, lines 11-17).

3) From the discussion on pages 12 and 13 of the specification with respect to Tables 1 and 2, the use of etchants with a combined HF concentration of less than or equal to 0.1% and an NH_4F concentration in excess of 40% by weight tend to produce etching rates in thermal oxidation, PL-TEOS, and TEOS-BPSG that are close to the etchant rates produced by those etchants in a natural oxidation film.

4) Such etching concentrations, as set forth in Item Nos. 2 and 3, also tend to suppress the widening of contact holes formed in such films, thereby allowing holes of a design diameter to be obtained (Tables 3 and 4 and corresponding pages 14 and 15 of the present specification).

5) Tables A-C are presented herein to further support the data initially provided in Tables 1-4 of the present application, as originally filed.

6) The newly provided and attached Tables A and B show additional etching rate and hole size data, respectively, which further support the data in originally submitted Tables 1-4. Meanwhile, Table C displays the data given in Table A in yet another format. Specifically, the difference in etch rate produced by a given etchant in a natural oxidation film as opposed to each of a thermal oxidation film and a PL-TEOS film is provided. As seen from Table C, these etch rate differences are all at their lowest (i.e., closest to the etching rate for a natural oxide film) when the HF and NH_4F concentrations are within the range set forth in claim 1.

7) Thus, with the data presented in Tables 1-4 and A-C, we, the Applicants, have established a criticality of the limitations on the etching concentration set forth in claim 1. The criticality is not merely established by any one group of the tabulated test results alone but by the combination of the various test results presented. It is the trend (i.e., the critical nature of 0.1% HF/40% NH_4F) common to the groups of test results that fully establishes the criticality and unexpected nature of the present invention.

8) Additionally, it is clear that Ohmi et al '582 does not address the issue of how the etchant concentrations of HF and NH_4F can be adjusted to both create more uniform etching rates in various types of oxide films and suppress the widening of contact holes formed in such oxide films.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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